



# The Need for Operationally Based In-flight Icing Training for Aviators

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## AIR LINE PILOTS ASSOCIATION INTERNATIONAL

- The Air Line Pilots Association is a union representing 66,000 airline pilots at 42 U.S. and Canadian airlines.
- Founded in 1931, it is chartered by the AFL-CIO.
- ALPA devotes more than 20 percent of its dues income to support aviation safety. A network of more than 600 working airline pilots serve on local and national safety committees to carry out the Association's safety work. They are assisted by a staff of professional aeronautics engineers and safety experts.
- ALPA has initiated or participated in most of the numerous safety improvements over the years that have made U.S. airline travel the safest mode of transportation





# ALPA's In-flight Icing Project



- Formed in 1995 after Roselawn accident
- Ice protection design and certification
- Operational rules/guidance
- Pilot education





# In-flight Icing Training for Aviators



- Current guidance and training
- Recommendations for future icing training










## Recommendations & Accomplishments

### MOST WANTED Transportation Safety Improvements Aviation Issue Areas

	<b>Airport Runway Incursions</b> <b>Action Needed by The Federal Aviation Administration</b>	Provide for Safer Control of Aircraft on the Ground.
	<b>Airframe Structural Icing</b> <b>Action Needed by The Federal Aviation Administration</b>	Revise Icing Criteria and Certification Testing Requirements. Research and Develop On-Board Aircraft Ice Protection and Detection Systems.
	<b>Explosive Mixtures in Fuel Tanks</b> <b>Action Needed by The Federal Aviation Administration</b>	Require Preclusion of Operation of Transport Category Aircraft with Explosive Fuel-Air Mixture in Fuel Tanks.

[Most Wanted Home](#)  
[NTSB Home](#)

[http://www.nts.gov/Recs/mostwanted/aviation\\_issues.htm](http://www.nts.gov/Recs/mostwanted/aviation_issues.htm)





“The icing certification process has been inadequate. ...Current ice detection/ protection requirements and application of technology may not provide adequate protection for a variety of ice accumulation scenarios.”

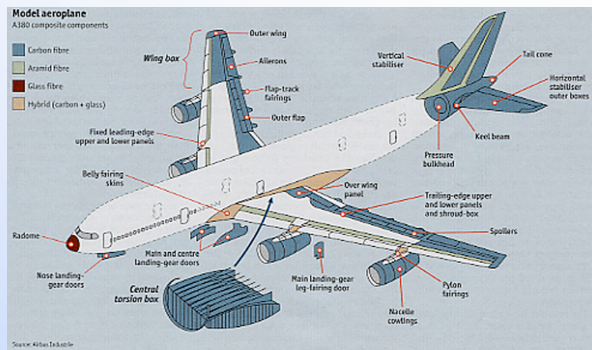
The NTSB website includes airframe structural icing in their list of “most wanted” items”.

[http://www.nts.gov/Recs/mostwanted/air\\_ice.htm#Safety%20Issue](http://www.nts.gov/Recs/mostwanted/air_ice.htm#Safety%20Issue)



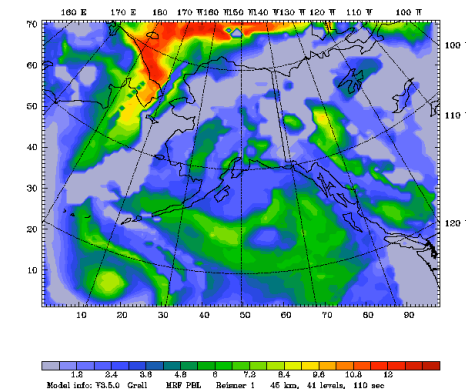


# Bridging the Gap



Pilot

Dataset: ALASKA RIP: ICING Init: 1800 UTC Sat 31 May 03  
Feet: 18.00 Valid: 1200 UTC Sun 01 Jun 03 (0400 LDT Sun 01 Jun 03)  
Column-integ. icing potential



**Design &  
Certification**

**Actual Operating  
Environment**





# Existing Icing Guidance

- Initial pilot training
- Professional pilot training
- FAA guidance
- Manufacturer guidance
- Pilot experience







# Initial Pilot Training

- Avoidance for VFR pilots
- Heavy dependence on weather interpretation
- Aircraft and pilot issues related to icing not given equal emphasis

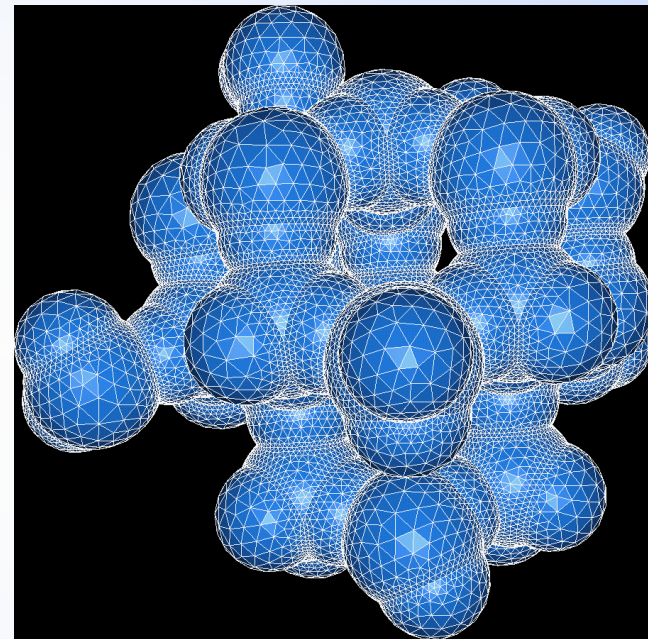






# Professional Pilot Training

- Minimal training if any
- Intentional operations in known large droplet icing
- Avoidance not always taught as a first response



Rendering of an ice crystal





# Airline Guidance

**Large droplet icing is not part of FAR 25 appendix C used for the certification of aircraft for flight into known icing. In spite of this fact most, if not all, airlines in the United States have written statements in their operation manuals which give tacit approval to their pilots to intentionally operate in some intensities of *freezing rain and drizzle (large droplet icing)*.**





# An operator example

- “The icing AD does not prohibit dispatching aircraft to an airport that is reporting freezing drizzle, light freezing rain or freezing rain, since freezing precipitation alone does not classify as severe ice.”
- “When ATIS, the tower or a PIREP reports freezing drizzle or freezing rain, beginning the approach is permitted ....”





# An Operator Example

- “landing the airplane when freezing rain/freezing drizzle conditions are encountered would, in many cases, be the most expeditious method of exiting the conditions”
- *Operators do not generally provide information to pilots on icing conditions considered in design and certification*







“C'mon, c'mon—it's either one or the other.”



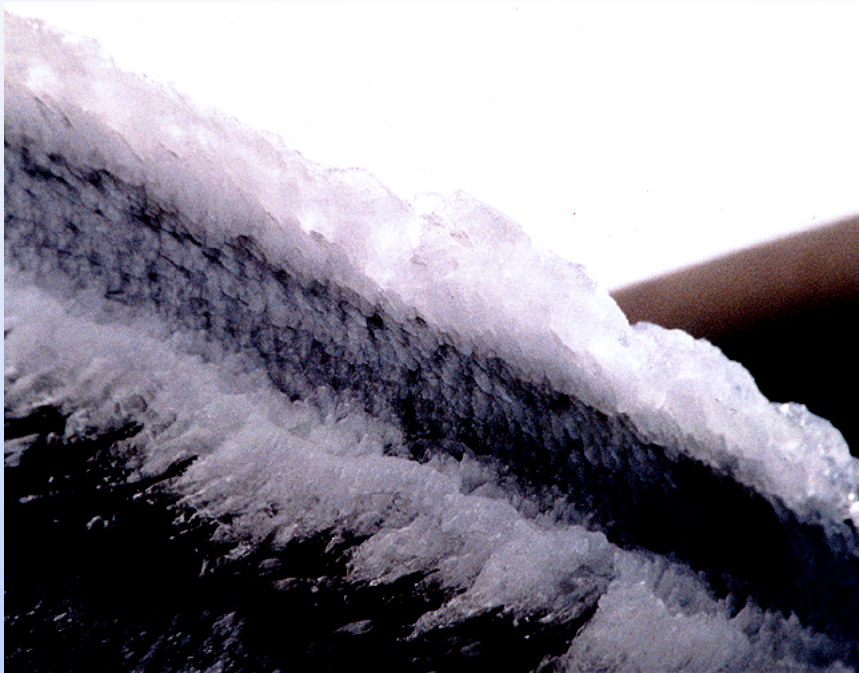


The primary means of detecting and assessing hazardous icing is visual and yet, the use of visual media (i.e. pictures, video, etc) in operator icing training is often limited or non-existent.





# FAA Guidance on Icing



- Contradicting messages on large droplet icing (SLD)
- Oversight of manuals at the air carrier level
- Reduced effectiveness of any warnings about in-flight icing





# FAA Guidance

- “Severe icing may result from environmental conditions outside of those for which the airplane is certificated. Flight in freezing rain, freezing drizzle, or mixed icing conditions .... May result in ice build-up on protected surfaces exceeding the capability of the ice protection system....”  
FAA AD 96-09-24
- “...that unclear and inconsistent messages to pilots about the operation of aircraft in icing conditions may create the misconception that flight in freezing drizzle and/or freezing rain is acceptable.”  
FAA Notice N8400.33 citing NTSB concerns





# FAA Guidance

- “The FAA strongly recommends that air carriers not dispatch or conduct flights into known or forecast severe icing conditions”

FAA Notice N8400.33

- Should freezing rain and drizzle be considered severe ?
- How are “severe” conditions determined?

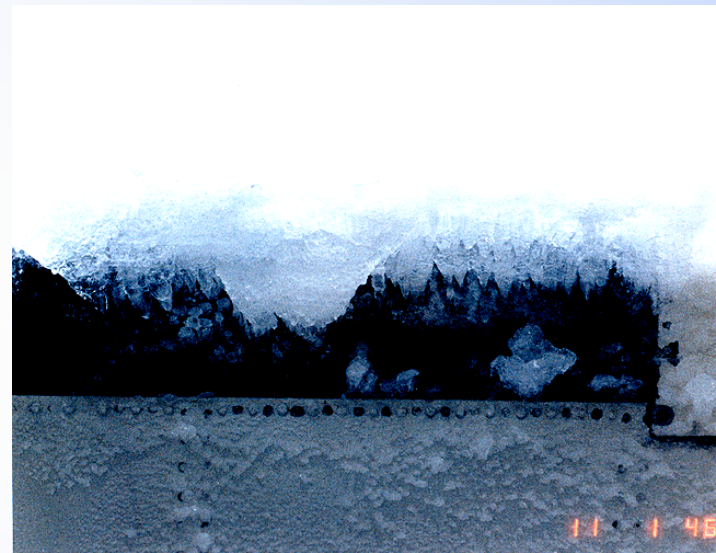






# Manufacturer Guidance

- All aircraft are not the same even though there is one icing certification standard
- Limited disclosure to pilot community







# Manufacturer Guidance

- FAA icing certification is not the final word on the icing capabilities of a given aircraft
- In the past the pilot community (not necessarily the operator community) has not been adequately informed of all available information related to their aircraft and icing





# Pilot Experience



- “A review of 120 airframe icing accidents involving aircraft commonly used in air carrier service dating from 1940 to the present day indicates that the average flight experience for the pilot in command was 7356 hours” Green





Experience is often the factor that makes up for other pieces that are missing. But experience that is not guided and accurately interpreted can have a negative effect on an aviator's ability to manage future icing hazards.





# Effective In-flight Icing Training

- Operationally based training
- A conservative approach!
  - Avoidance is not a dirty word
- Selecting between options
  - Decision making skills
- Aircraft specific training
  - Honest and open disclosure
- A Clear and Consistent Message
  - FAA oversight
- Meteorology
  - Accurate and timely to the pilot





# What pilots really need to know

- Why can icing be hazardous to aircraft?
- What type of icing is my aircraft designed and certificated for?
- How can the level of risk of a particular icing environment be assessed?
- What are possible operational responses to icing environments?
- What are the recovery procedures for an icing induced loss of control?







# Recent Work



NASA Glenn Training  
materials

**FAA**

AC 91-74 Pilot Guide –  
Flight in Icing Conditions





# Ice Proof Pilot?

